not widely differ from that of *Podica*; the lateral margins are more concave, since the lateral processes jut out at a larger angle with the median axis. These processes, moreover, do not extend beyond the posterior margin of the sternum. The sternum also is shorter in proportion to its length in the American than in the African Fin-foot.

The measurements of the sternum of *Heliornis* are as follows:—Length 35 mm.; least breadth 16 mm.

With these measurements may be compared those of *Podica*:—Length 68 mm.; least breadth 20 mm.

The median interclavicular piece of the merrythought is not prolonged forwards, as it is in *Podica*.

VI. *Pelvis.*

There are hardly any points of difference between the pelvis of *Heliornis* and *Podica*. All the characteristic features of this part of the skeleton as described in *Podica* exist in *Heliornis*. The ridges on the ischia are, however, less conspicuous in the American Fin-foot.

I have already compared the *ribs* and *vertebræ* of these two birds, and need not recapitulate here what has been said in my paper in the P. Z. S. (*t. c.*).

III.—*On the Extinct Giant Birds of Argentina.*

By R. Lydekker.

For the last few years the palæontological world has been flooded with accounts of the wonderful discoveries of mammalian remains belonging to new or little known types which have been made in the Tertiary deposits of Argentina. These discoveries have rendered it certain that, instead of having to do merely with a single fauna of Pleistocene age, we have there laid before us a whole series of faunas, which evidently occupied a considerable portion of the Tertiary period. The geologists and palæontologists of Argentina are, indeed, of opinion that the deposits yielding vertebrate remains are equivalent to the whole of the European Tertiary series, from the Pleistocene to the Lower Eocene, inclusive. Personally, however, I have considerable doubts whether the inferior beds are really as old as the Lower Eocene, although they contain certain mammalian groups more or less closely allied to those of the European Eocene; but it must be admitted, in any case, that they occupy a position some considerable way down in the Tertiary series.

Now it is from these lowest beds that there have lately been brought to light the fine series of remains of giant extinct birds which have been described by Señores Ameghino, Mercerat, and Moreno in the memoirs cited below *. With that peculiarly unfortunate fatality which appears to be inseparable from vertebrate palæontology in Argentina, these fossil birds have, however, already become involved in a labyrinth of confusion and puzzling synonymy, comparable to that which renders the study of the fossil mammals of those regions so disheartening and repulsive to the European student.

The mischief began by the first of these remains being described by Professor Ameghino in 1887 as mammalian, under the uncouth name of *Phorusrhacos*; and it was not till 1891 that its describer found out that the presumed Edentate jaw was in reality part of an Avian mandible. In referring this jaw (which is figured, p. 42, reduced from the original given by Prof. Ameghino) to a bird, Prof. Ameghino took the opportunity of describing part of a cranium and some limb-bones belonging either to the same or a closely allied bird, also of amending the name to *Phororhacos* †; which term, it is quite evident, in spite of its uncouthness, is the one which must stand for the bird in question. Beyond the figure of the typical mandible, this memoir was unfortunately not illustrated, and the author made no attempt to determine the systematic position of the newly discovered bird.

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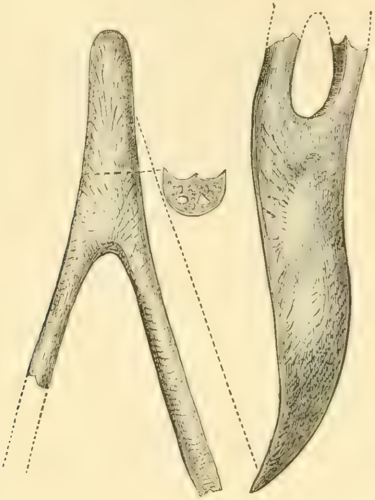
* Ameghino, C. "Aves fósiles Argentinas," *Revist. Argent. Hist. Nat.* vol. i. pp. 255–259 (1891).

——. "Enumeracion de las Aves fósiles de la República Argentina," *ibid.* pp. 441–453.

Moreno, F., and Mercerat, A. "Los Pájaros fósiles de la República Argentina," *An. Mus. La Plata*, vol. i., plates (1891).

† [We might suggest its further emendation to *Phororhacis*, its derivation being, we suppose, *φορέω* and *ῥακὶς*, a branch.—Ed.]



Lateral and inferior views of the front portion of the mandible of *Phororhacos longissimus.* $\frac{1}{6}$ nat. size.

The want of illustration in Prof. Ameghino's memoir was fully remedied by the folio work of Señores Moreno and Mercerat, which contains a large number of finely engraved plates fully illustrating the osteology of the limbs of these giant birds. The remains were referred by these authors to no less than nine distinct genera, under the names of *Phororhacos, Brontornis, Palæociconia, Mesembriornis, Stereornis, Patagornis, Dryornis, Darwinornis,* and *Rostrornis.* And here I may remark that the barbarism of such terms as *Darwinornis* and *Owenornis* is only paralleled by the bilingual origin of the name *Rostrornis.* The authors of this memoir arrived at the conclusion that these birds belong to a totally distinct primary group, of equal rank with the Ratitæ and Carinatæ, for which the name Stereornithes was suggested. No characters of sufficient importance to justify such a bold innovation were, however, given, the main feature upon which the authors appear to have relied being the absence of a pneumatic foramen in the femur.

Shortly after the appearance of this memoir—which must always bear a high value on account of the excellence of its illustrations—Prof. Ameghino published another paper criticizing and revising the work of Señores Moreno and Mercerat. The results of his investigations were to the effect that, while the genus *Brontornis* (with *Rostrornis* as a synonym) was entitled to stand, the whole of the other names proposed were merely synonyms of the original *Phororhacos,* of which six species were admitted. The author added, however, a third genus, which he named *Opisthodactylus,* distinguished by a peculiarity in the position of the facet for the hallux on the tarso-metatarsus. It may be added that, although Señores Moreno and Mercerat considered the birds described in their memoir to indicate no less than four distinct families, yet Prof. Ameghino included the whole of the three genera that he admitted in the single family *Phororhacidæ,* which was placed among the Ratitæ. Although we remember the lesson taught by the Moas as to the difficulty of separating generically well-marked avian forms upon the evidence of the limb-bones alone, yet, so far as we can judge from the materials at hand, Prof. Ameghino appears to have been perfectly justified in ruthlessly cutting down the genera of his *confrères* in the manner he has done.

Having said thus much as to the historical aspect of the subject, we are in a position to consider what can be determined as to the affinities of these remarkable birds, which appear to have been very common in Argentina during the Tertiary period. And here I may remind my readers that giant flightless birds occur in the Lower Eocenes of Europe (*Gastornis* and *Dasornis*) and of North America (*Diatryma*); but that at present none are known between that period and the Pliocene, unless, indeed, these Argentine forms belong to some portion of the intervening gap.

As regards dimensions, it appears that these Argentine birds not only rivalled but in some cases actually excelled the largest of the New Zealand Moas—the tibia of *Brontornis* measuring 30½ inches in length, against 39 inches in the tallest Moa; while the skull of *Phororhacos longissimus* is considered to indicate a bird much larger than either *Brontornis* or the most stately *Dinornis*.

The most peculiar feature of these birds is undoubtedly the form and structure of the skull, which is quite unlike that of the Moas or that of any existing Ratite bird. Unfortunately the cranium is at present only known to us by a brief description, without a figure, and we have accordingly to rely mainly on the mandible. In the typical mandible of *Phororhacos*, of which the anterior portion is figured in the accompanying woodcut (p. 42), the most noteworthy features are the enormous size of the specimen, the extreme narrowness and length of the symphysis, the large size of the lateral vacuity, and the somewhat sigmoid profile and upturned point of the entire ramus. To give some idea of the size of this jaw, it may be mentioned that the length of the symphysis is upwards of 6¼ inches, while to the hinder third of the lateral vacuity the length is fully 11½ inches. It may accordingly be estimated that the total length of the whole jaw could not have fallen short of between 20 and 24 inches. Such a jaw must have been as large as that of the extinct Edentate *Scelidotherium*, and Prof. Ameghino may therefore be well excused for having at first taken it for that of a mammal. In general contour this mandible is more like those of *Psophia* and *Cariama* than that of any other living bird. In the cranium the beak is described as compressed and curved, with its tip overhanging that of the mandible; but the most remarkable feature is the occurrence of two alveoli on either side of the upper jaw, which are considered to have carried large teeth. It is further inferred that the skull was surmounted by a horny casque, owing to the presence of rugosities on the frontal region.

It may be remarked here that Prof. Lemoine* has described, in the alveolar border of the premaxilla of *Gastornis*, a large circular swelling which he regards as having been the base of a tooth-like process formed by the jaw itself. It appears to me, however, that this swelling looks much more like a true dental alveolus, which, owing to the shedding of its tooth, had been filled up with bone. And I may add that, as the skull of *Gastornis* is known only by mere fragments, its restoration by Lemoine (in which a length of about 12 inches is assigned to the mandible) is largely conjectural.

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* Rech. Oiseaux Fossiles, pt. ii. (Rheims, 1881).

Prof. Ameghino considers that *Phororhacos longissimus* was of about double the dimensions of *Brontornis burmeisteri*, in which the length of the tibia was 30½ inches!

With regard to the limb-bones of these birds *, the most characteristic features appear to be that the femur had no pneumatic foramen, that the tibia had a bony bridge over the extensor canal at its distal extremity, and that its anterior intercondylar gorge was very deep, with the condyles very prominent. The tarso-metatarsus is of considerable length, and very wide above, with the intercotylar tuberosity very tall and the upper part of the upper surface deeply excavated. In the latter respect this bone resembles the tarso-metatarsus of *Æpyornis*; but in that genus there is no intercotylar tuberosity to this bone, and no distinct intercondylar gorge to the tibia. *Gastornis* has a more slender tarso-metatarsus with a prominent intercotylar tuberosity, and a deep intercondylar gorge to the tibia. It was at first thought that the hallux was wanting, but subsequent research proved this to be incorrect. Unfortunately, nothing appears to have been discovered of the sternum; and the information relating to the wings is still very meagre, although these appear to have been present in some form or other.

That birds of the gigantic dimensions of *Phororhacos* and *Brontornis* must have been flightless is self-evident; and, so far as the present descriptions and figures admit of forming a judgment, there appear no characters by which they, in common with *Gastornis* and *Dasornis*, can be satisfactorily separated from the Ratitæ. In the presence of a bony bridge over the extensor groove of the tibia, the South American forms resemble the *Dinornithidæ*, and thereby differ from all existing representatives of the Ratitæ. They likewise approximate to *Dinornis* (as distinct from the other Moas) and *Gastornis* in the general proportions of the tibia and tarsometatarsus; the trochleæ of the latter bone having, indeed, precisely the same relative lengths as in the European genus. It is true that the lower end of the tibia has not the inflection characteristic of *Gastornis*, but the Moas show that this feature is not of more than generic importance. So far, therefore, as the limb-bones go, *Phororhacos* and *Brontornis* might apparently be distantly related to *Gastornis* and the Moas. The skulls of the latter show, however, that the giant New Zealand birds are of a type widely different from those of South America; although, if we believe in an affinity between the Moas and the Kiwis, we must not attach an undue weight to this point of difference.

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* Casts of some of the limb-bones of *Brontornis* have recently been received at the British Museum.

With regard to *Gastornis*, the case is more difficult. According, however, to Lemoine's restoration, the mandibular symphysis was short, and the upper jaw wider than in *Phororhacos*. Still, however, we have a declination of the tip of the premaxilla comparable to the description of the latter; and, for what it is worth, the presence in both of alveolar-like structures.

That both *Gastornis* on the one hand, and *Brontornis* and *Phororhacos* on the other, cannot be excluded from the Ratitæ as at present defined, appears, as I have already said, certain. If, however, they be rightly included in that group, and the presumed affinity of *Gastornis* to the Anseres be sustained, while the apparent resemblance of the jaw of *Phororhacos* to *Psophia* indicates a relationship, then we shall have confirmatory evidence in favour of the modern German view that the Ratitæ form a compound group, of which the various sections have been independently derived from several perfectly distinct Carinate ancestors, and that their mutual resemblances to one another are solely owing to the effects of adaptation. I confess, however, that the supposed Anserine affinities of *Gastornis* appear far from clear to me, while I always feel that the great difficulty in admitting the multiple origin of the Ratitæ is that if this had been the case there would have been far less structural similarity to one another among the various groups than we find to prevail.

IV.—*Notes on the Birds of the Loo-Choo Islands.*

By Henry Seebohm.

My collector, Mr. Holst, has just returned from a visit to the Loo-Choo Islands [*] and has sent me a box of birds, amongst which are some specimens of great interest.

The numbers prefixed to the names in the following list are those of my book on 'The Birds of the Japanese Empire.'

Except when stated to the contrary, the birds were collected on Okinawa-sima, the largest island in the central group of the Loo-Choo Islands. To other localities belong only a couple of birds obtained during the voyage in the northern group, and a few skins from Tsu-sima.

7. Merula pallida.

A female shot on the 30th of March, probably a winter visitor.

8. Merula chrysolaus.

Four examples. They are said to be winter visitors, from November to May. Great numbers passed through on migration during March. The most numerous Thrush on the islands.

9. Merula pallens.

Two examples.

12. Erithacus namiyei.

Mr. Holst has sent two examples of this very distinct species, an adult male and an immature male, which, along with the adult female in the Pryer collection, make a very interesting series.

The adult male is described as having the irides dark brown, the bill jet-black, and the legs flesh-coloured.

The immature male resembles the female in the colour of

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[*] See Ibis, 1892, p. 575.